PRIVATE SECTOR DEVELOPMENT OF HOUSING EASTERN EUROPE

REHABILITATION DEMONSTRATION BULGARIA

Prepared for

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2 INTRODUCTION

PADCO's project team recently completed a rapid reconnaissance of existing housing in Sofia as part of an ongoing effort to demonstrate the feasibility of private sector rehabilitation and renovation of deteriorating urban housing in Bulgaria.

Among the types of residential buildings inspected were single-family and multi-family structures both in central Sofia and in the surrounding suburban municipalities such as Lozenec, Mlodast, Triadiza, Krasna Polvana and Ljulin. The buildings inspected were representative of the housing stock in Bulgaria and included low and mid-rise, non-elevator traditional buildings built before 1960; and mid and high-rise, elevator industrial structures built after 1960.

The population housed in these large, multi-family development areas, largely consisting of a mix of 9- to 21-story high-rise structures, ranges from 80,000 to 325,000. While touring these housing areas, the team inspected the grounds surrounding the buildings, their common elements and a representative number of owner-occupied flats (apartments). Both completed and construction-in-progress buildings were inspected.

Municipal Maintenance Company staff personnel and flat owners were interviewed regarding the performance and maintenance of these buildings. In addition, municipal building officials, private developers, contractors and real estate brokers were interviewed to help round out background information on issues relating to the private sector housing environment in the greater Sofia area.

Our mission in this endeavor has been to identify a residential project that will demonstrate the feasibility (financial, technical and social) of private sector renovation and rehabilitation that addresses the country's significant problem of rapidly declining housing stock quality.

A suggested work plan has been developed for this demonstration project that includes proposed staffing and timing for a feasibility study of a representative building to help in implementing the rehabilitation goals of this study.

4 BACKGROUND

The political changes that have occurred in Bulgaria as it moves from a centrally planned state to a market-oriented economic system have resulted in a building industry that is in transition. The nation continues to struggle with its stabilization program, privatization, restitution and regulatory and economic reforms.

The city of Sofia's housing stock consists mainly of blocks of flats surrounding the central core. Fully 92 percent of the city's population lives in this type of housing in large municipal complexes such as Mlodast and Ljulin. By contrast, in small towns and villages in rural Bulgaria only 13 percent of the population lives in such complexes.

The large residential blocks were built to house the inward migration of population from the countryside to urban areas shortly after WWII. This was largely in response to increased population, industrial development in the large cities and better employment opportunities. During this period, the growth of the towns had a positive effect on the building industry by increasing the demand for new residential buildings. The construction costs were kept artificially low by a system of state subsidies and by low interest loans offered by the state banks for building purposes. This policy has resulted in multi-storied building blocks surrounding Sofia that were produced exclusively by industrial technologies.

Large panel, pre-cast concrete structural methods, presently called "industrial slab" construction, were widely used. At present, industrial slab represents 70 percent of the housing stock around Sofia. The low quality, obsolete technology, lack of appropriate insulation materials of these industrial slab buildings represent some of the most serious problems facing the Bulgarian housing sector at this time.

These large buildings have become problems now because the producers had no interest whatsoever to make improvements in the technology nor labor organization needed to erect these buildings due to a lack of competition. The main customer was the state and it was only interested in building more dwellings and in selling them at pre-fixed prices.

There are four other types of high-rise building construction. First, approximately 8 percent of the buildings are built as "traditional monolithic" construction. These differ from the previously described industrial slab type in having a poured-in-place, monolithic concrete floor, beam and column structural system that has been reinforced with steel. Walls are composed of clay tile and plaster interior finish and stucco exterior finish. The quality of construction is better than the industrial slab type.

Two forms of cast-in-place construction exist in the Bulgarian high-rise housing industry: the "shutter system" construction and the "tunnel system" construction. Both are variations of two types of concrete form work. The shutter system utilizes vertical steel forms held in place by whalers and a horizontal metal floor form held in place by adjustable posts. The tunnel system utilizes an "L"-shaped steel form which defines one-half of a wall and the floor. Combinations of these forms result in a monolithic poured structure between the floors and walls of each building level. These two types of construction account for 18 percent of the housing stock.

The remaining high-rise construction method used for housing is called "lift slab" or "drop slab" construction. The structural system consists of structural steel columns and concrete floor slabs that are formed and poured-in-place on the ground. The slabs are then raised to their final positions by lifting them with steel cables attached to hydraulic lifters atop each column (lift slab

type) or are all raised to the top of each column simultaneously and lowered into place by cable (drop slab type). This construction method accounts for 4 percent of the housing in the greater Sofia area.

It should be emphasized that the traditional monolithic, shutter, tunnel, lift slab and drop slab construction types are better construction methods than industrial slab because these other methods do not rely on the grout in-fill method of finishing the intersecting joints between pre-cast concrete panels at the walls and floors. For this reason, the industrial slab method of construction is decreasing while the remainder are increasing in use. However, there remain many industrial slab buildings that are still incomplete or under construction at this time.

6 OWNERSHIP AND MAINTENANCE

It is estimated that 94 to 95 percent of the housing stock in Bulgaria is privately owned. The restitution law passed by the Bulgarian parliament restored the ownership of expropriated residential and non-residential buildings to their original owners. This process is still ongoing, particularly in regard to land around Sofia. At this time, approximately 50 percent of the land in Sofia is privately owned. The remainder belongs to the municipality, which is responsible for its upkeep.

Housing occupancy primarily consists of private owners with renters occupying some municipally owned flats. These types of occupancies, mixtures of owners/renters and socio-economic mix of tenants/owners, are the most difficult to manage due to the structure and organization of their cooperatives. All must agree to make repairs and maintain common elements of the building. When buildings are more homogenous in their socio-economic population, more cooperation is evident.

Despite the very high proportion of owner-occupancy, maintenance has not been conducted regularly except on an emergency repair basis. It was a common consensus among most persons interviewed that the occupants were not very interested in unit or building maintenance or upgrade. Among the most obvious of the reasons for this attitude is financial inability to pay for the needed repairs in this transitional period of high inflation and lack of financing. Banks are very reluctant to loan money on rehabilitation of existing housing or simply not interested in being involved in the construction industry.

Another reason for the owner-occupants' lack of interest in maintenance might stem from the fact that the building grounds are the municipalities' responsibility. The management and maintenance companies of local municipalities are present on all mixed ownership housing complexes and are only responsible for the state housing stock and for collecting rents for their flats. The buildings' common elements such as the roof, facade, plumbing, electrical systems are maintained by private service companies who work directly for the building cooperatives who are organized around each stair/entrance. For example, a common structural balcony slab repair problem on a large building with six stair entrances would have to have financial approval of six cooperatives. Any individual may elect to reject the repair, thereby stopping the repair for that

stair/entrance cooperative, possibly even the entire building. Another example of a common element is the heating system. The city of Sofia supplies central heating from its six central power plants by underground hot water lines up to one-foot of each building. The cooperative is responsible for the vertical heating riser in the chase while the individual owner-occupant is responsible for all interior terminal units and fittings.

In the municipality of Triadiza (population 82,000), a typical state flat is 100 square meters. The monthly rent is 30 leva, while tenants monthly income is 3,000 leva. Rent is symbolic (1 percent of income) and does not cover the real costs of the flat. The state has no special program to provide maintenance of its housing stock. Each municipal management and maintenance company must use the funds available to make only the most urgent repairs. Twice a year, an inspection is made of all state units. All defects are noted and repair work calculated. Last year in Triadiza, repairs required amounted to 1,000,000 leva. The budget allocation available to make these repairs was 250,000 leva.

The restitution law has also caused serious problems. If a tenant is not sure of the status of his flat, no investment is made to repair the flat because there is no guarantee the money required to make the repair would be returned. There is a 25-year old regulation in effect (Regulation 15) that deals with the structural elements and parts of buildings with regard to the frequency of construction repair work. It calls for ongoing maintenance and repair of all depreciable components and systems every 5 to 100 years, depending upon the system. Many buildings in Triadiza are 30 to 40 years old and are not being maintained. This regulation is being amended to adjust the various repair frequencies to reflect this lack of maintenance of the housing stock.

The current condition of the existing housing stock (and particularly the industrial slab type), due to the accrued effects of deferred maintenance and the low quality of construction and materials, results in shorter economic life and the need for more rapid replacement. This is the most serious problem facing the Bulgarian housing industry today. To date, the housing industry and building trades have been oriented to new construction. Because financing for maintenance and rehabilitation has been minimal, there is no tradition of a rehab industry.

8 HOUSING NEEDS SUMMARY

This report summarizes the impressions, conditions and physical needs of a variety of characteristic residential properties in six different municipalities in the greater Sofia area. Four different types of high-rise buildings (up to 21 stories) were inspected along with lower-rise traditional monolithic (4 to 6 story) buildings and single family structures. Most were completed and occupied, but some were under construction or partially complete. Ages of construction spanned the period from the 1950s to the present time. In addition, commercial and industrial properties were visited including a large clinic (hospital) conversion project.

Based on this reconnaissance, the following summary of existing conditions has been prepared.

8.2 Site

Site grading, landscape materials and paved surfaces, such as parking areas, access roadways and pedestrian walks are in various states of disrepair. Few instances of site maintenance were evident, particularly near partially completed or building properties under construction. With a building period of some projects of six to seven years, this lack of site maintenance tends to visually depress the surrounding area.

8.4 Building Exteriors

The most obvious impression formed by the numerous high-rise industrialized residential blocks was the lack of design control of the treatment of the balconies. Typically, balconies facing south were left open while those balconies facing north were enclosed by various different wall or screen systems. The enclosures were done by the owner-occupants and varied in treatment. Pre-finished aluminum mullions and glass curtain wall and wood enclosures were common. Metal railings and panels were frequently corroded. Cantilevered balconies were often cracked with spalled areas along their outer slab edge. Reinforcement steel was visible at the spalled edges at some locations. Slab slope toward the building wall created some moisture problems at the base of the wall where it rests on the slab where the sealant has failed at the joint.

The condition of the joints of the industrialized slab buildings is a problem. The cement parging (skim coating) that was used to cover this intersection (both vertically and horizontally) is cracking and separating, allowing water penetration into this joint. This results in corrosion of the steel reinforcing holding the panels together, deterioration of mortar grout that fills this joint and allows thermal bridges into the interiors of the unit. Not only cold air drafts enter the unit, but moisture as well. This joint detail has been changed on newer industrial slab buildings to a system that includes an aluminum baffle insert in the joint to preclude water and air penetrations. However, the vast majority of the housing stock still has the original obsolete detail with its inherent problems. Interviews with building officials, engineers and architects, and maintenance companies cite this detail as the most problematic of the industrial slab type of building. How much damage has occurred to the steel panel connectors has not been determined. Symptomatic of this condition, joint parge coat plaster is separating along most of the older buildings.

8.6 Windows and Doors

Wood sash and single glazing was the most typical window found at the properties, although some newer properties had metal and vinyl sash. Most of the problems associated with the windows related to glazing putty, weatherstripping and design. Casement type windows are thermally inefficient. There was a problem noted regarding the fit of windows to the openings of both industrialized slab (concrete walls) and traditional monolithic (clay tile walls) constructed buildings. In all cases, wide gaps exist between the window sash and the wall material that were not insulated before being finished with the plaster wall returns. This results in cold spots and heat loss along the openings as a consequence of these thermal bridges.

8.8 Roofs

Maintenance companies interviewed all said that flat roof repair was the most frequent emergency repair at the complexes. Many buildings do not have central television antenna systems. Tenants have installed numerous individual antennae, damaging roofing and invalidating warranties. The chief cause of this problem is the lack of adequate parapet wall counter-flashing below copings and poor quality of the asphalt roofing felts. Also of concern are the large number of leaks reported by tenants from the top of bathroom pipe chases. The ventilation openings are flush with chase wall and masonry cap and do not have weatherproof baffles. This detail also makes flashing difficult. Flat roofs were either multi-ply built-up asphalt or single-ply rubber membranes.

Other types of roofing observed were clay and concrete tile sloped roofs and copper covered sloped roofs. The tile roofs in the older buildings did have some leaks due to inadequate or damaged membranes or support structure. Very little, if any, insulation was noted in any of the roofing installations observed.

8.10 Canopies

In general, cantilevered concrete canopies at stair entrances were in very poor condition. Slabs were cracked, spalled and roofing was deteriorating. Entrance doors were in need of repair and maintenance.

8.12 Stairways

Most stairs were concrete with terrazzo or stone treads and risers. There were wide gaps between stairs and wall and between stairs. Railings were horizontal without vertical pickets. The plaster interior walls were generally damaged at two locations: in the center of each interior landing where telephone cabling is located close to surface spalled plaster top coat, and where plaster spalling occurs at the grouted joint between the juncture of two walls.

8.14 Elevators

The small five passenger elevator cabs (1100 x 1100 cm) found in the typical high-rise building are provided with three metal panel walls. The fourth side is open to the floor level entrance door and the floor construction between levels. This gap between floors is generally finished with ceramic tiles. Maintenance of the cabs and finishes was poor with many without lighting due to burned out light bulbs. All cabs needed adjustment in that they did not align with floor levels.

8.16 Apartments (Flats)

The interiors of flats inspected were in good condition. Floor finishes ranged from carpet, sheet vinyl tile, wood parquet and ceramic tile. Wall finishes were painted plaster and vinyl wallcovering. Kitchen cabinets, appliances and finishes varied, but were generally in good condition.

Bathrooms, however, had problems. Two different pre-cast concrete modules were used in the panelized buildings depending on whether the bathroom had the water closet installed in or out of the module. Most of the older buildings had a shower arrangement rather than a bathtub. The shower did not have a drain pan with the result that water could be sprayed all around the bathroom and wet the floor to the centrally located floor drain. If the shower had a receptor, drainage could be confined to the shower and shower curtains could be used for privacy and water spray control. The ceramic tile floor base had gaps in the tile grout which allow water penetration into the joint formed between the precast wall panel and base. Water leakage to the bath module below corrodes steel reinforcing and plates. Another problem with water is the lack of GFI (ground fault interrupters) in the electrical outlets in this module. The other problem inherent in the design of the bathrooms is the gravity ventilation system. The vertical plumbing chase had a round grille in each bathroom module. The lack of a forced air ventilation system and openings onto each apartment along the plumbing chase creates a wet, moist environment and a lack of privacy between apartments. In addition, this vertical chase serves as a fire hazard. Smoke from a fire below can enter the chase and fill all apartments connected to the chase.

8.18 Heating System

The apartment (flat) heating system consists of hydronic radiation connected to the building's central 2-pipe system. The only in-unit temperature control is by a valve located on each terminal unit. As this valve is often hidden behind wood or metal shielding, space temperature control is often accomplished by opening a window or door. This arrangement is a clear energy waster. The terminal units are of two types: the panel type, which has a useful life of 7 to 10 years, and the cast iron columnar type with a useful life of 15 to 20 years. Most apartments had the panel radiators.

8.20 Plumbing

Domestic hot and cold water was generally distributed throughout the building by threaded galvanized (zinc coated) steel piping. Joints of piping were of the older sealant type and most problems occur because of this threaded joint. Another plumbing problem occurs when, in winter, heat is only provided in the daytime hours. Water remains in the pipes and radiators and can freeze. Also, it tends to corrode the piping.

8.22 Electrical

Most of the electrical power failures in these buildings occur in the municipal underground service conduits. Electric service improvement by the municipalities is currently under way, but brown-outs are still common in the winter due to a shortage of power. The lack of GFI outlets in the shower enclosures has already been mentioned.

10 PHYSICAL NEEDS DISCUSSION

It is helpful to categorize all of a building's physical needs into three distinct categories so that a rational plan of action can be adopted: immediate repairs, ongoing maintenance and suggested improvements. It is also useful to define the problems in terms of whether the problems are related to distress, damage or deterioration. Distress can be defined as minor irregularities that can be corrected if done promptly. Damage occurs when components must be repaired or replaced due to some physical or design disfunction. Deterioration occurs when a material has reached the end of its useful life and must be replaced.

10.2 Immediate Repair

These are structural defects that require immediate repair or replacement due to serious health or safety issues. Examples would include a badly spalled balcony slab or a broken heating line.

10.4 Ongoing Maintenance

These are routine maintenance repairs that relate to service of equipment, materials and finishes. These items are normally accommodated within a replacement reserve and relate to the components normal useful economic life as listed in Regulation 15. Items generally are replaced due to normal wear and tear and deterioration. An example would be the replacement of an old roof.

10.6 Suggested Improvements

Suggested improvements refer to building upgrades to comply with recent code changes relating to energy, seismic, fire, environmental, and hazardous materials, and other criteria. They also are in response to an effort to reduce maintenance costs or due to a desire to extend the building's useful life. Examples of these kinds of improvements would be reinforcing the precast concrete panel connector, providing "X"-bracing to accommodate the new 9-rating of the seismic code or upgrading an asphaltic built-up 10 year type roof with a single-ply 20 year type roofing membrane. Also, this type of improvement could be in response to the owner-occupant's desire to increase the economic value or esthetics of his property. An example would be balcony enclosures.

Based on our reconnaissance of selected housing around the greater Sofia area, we would categorize the problems in the following manner:

Immediate repairs:	Structural slab joint damage correction Install (GFI) electrical outlet in baths Install shower receptors
Ongoing Maintenance:	Site grading, walk/paving repairs Balcony/canopy slab distress repairs Exterior deteriorated sealant Balcony railing and panel distress repairs Elevator service Stairway finish damage repairs
Suggested Improvements:	Balcony enclosures Roofing upgrades (flashing and membrane) Bathroom chase mechanical ventilation Heating valve installation

12 DEMONSTRATION PROJECT

In selecting a demonstration project, it is important that this project focus on the most representative construction type in the Sofia area in order to have the most impact in dealing with the problems of rehabilitating the housing stock. Because the majority of the housing stock is of the industrial slab type, it would be desirable to focus on this type's problems. In addition to the structural issues, there are the financial and social problems to overcome. While rehabilitation of a five or six-story, socially/economically homogeneous building with traditional monolithic construction would certainly be easier to accomplish, the nation must update and improve its vast stock of industrialized housing. Only in this manner can it begin to stimulate positive attitudes and interest with the investors, building organizations, banking institutions and general population.

In selecting demonstration projects, there should be an opportunity to eliminate the structural defects inherent in this type of construction, extend the useful lives of these buildings and have the potential to provide improvements and upgrades in the physical and esthetic environment for the owner-occupants. In this way, it will serve as a comprehensive example for the rest of the housing community to follow.

Potential demonstration sites in Sofia include:

LOCATION	ADDRESS	YEAR BUILT	DESCRIPTION
Mlodast	351	1975-82	9-story (ind. slab)
Mlodast	351b (entry 6)	1975-82	9-story (ind. slab)
Mlodast	352	1975-82	9-story (ind. slab)

LOCATION	ADDRESS	YEAR BUILT	DESCRIPTION
Emil Markov	238	1970	6-story (ind. slab)
Emil Markov	242 (entry a & b)	1970	6-story (ind. slab)
Krasna Polvana	620	1975	7-story (ind. slab)
Ljulin	106	1986	7-story (ind. slab)
Ljulin	503	1986	7-story (ind. slab)
Ljulin	518	1986	7-story (ind. slab)
Ljulin	543	1986	7-story (ind. slab)
Ljulin	628	1986	7-story (ind. slab)
Ljulin	732	1986	7-story (ind. slab)
Ljulin	734	1986	7-story (ind. slab)
Triadiza	7 Jaroslav Veshin	1990	6-story (trad. mono.)

Of the fourteen potential demonstration sites selected, the **Mlodast (351b)** site is the most typical example of the problems indicated in this report, followed closely by the **Ljulin (503)** site. The **Triadiza (7 Jaroslav Veshin)** site would be a good demonstration site to compare timing, results and process with the more difficult large high-rise buildings.

It should be mentioned that at present, owner-occupants and renters are reluctant to contribute to ongoing maintenance of the common spaces of the building except in emergency situations such as in the case of a broken heat pipe or major roof leak. It has been suggested that the reasons are financial (high cost of labor, materials due to inflation) and possibly a lack of experience or tradition in dealing with such issues. In the past, the building exterior repairs were done by the state. At the present time, most tenants of the housing blocks are planning to move out when new units become available. As a result, buildings continue to deteriorate from the deferred maintenance. The problem with this attitude and approach is that building deterioration accelerates with time and repairs become more costly. The quality of the built environment deteriorates further and the attitude of the owner-occupants and renters becomes increasingly negative toward rehabilitation.

Management and maintenance company officials all say that rehabilitation programs are possible in theory. Bi-annual surveys of flats and buildings concerning defects or problems are on file and are computerized for use. They are aware of the degree of aging or deterioration of the various building components and can predict fairly accurately when repairs or replacement will be needed. They know the various construction technologies needed to keep their properties well maintained. These management companies have all stated that they simply do not have the

budgets to do adequate building maintenance, nor do the owner-occupants have the desire to do so. Their responsibility is to deal with emergencies and serious problems, similar to a fire brigade dealing with fires.

In order to reverse this attitude and to convince owner-occupants and tenants to bear the financial burden to pay for necessary repairs and ongoing maintenance of their buildings, a major effort to educate them will be required. Each cooperative group should be given a number of options on how to deal with their common areas. Work plans and budgets can be developed that vary in scale and scope depending on the wishes of the group. Owners who intend to sell their units when new housing becomes available should be convinced that selling their flat at the best possible price is directly proportional to the condition of their flat and the building's common areas. At present, according to brokers, most sellers are asking unrealistic prices for their flats.

It would be economically beneficial to owners to invest in a rehabilitation program to extend the useful life of the building while they wait for available housing. Examples of these kinds of repairs would be the repair of exterior slab joints on industrial slab buildings.

In order to increase the livability of the flat itself, certain amenities could be provided such as bathroom ventilation, shower or bathtub inserts, radiator thermostatic control valves or balcony enclosures. These improvements can save energy for the tenants and even extend their living space.

More ambitious improvements to the housing blocks could also be attempted. Building units could be altered to form maisonettes by developing vertical circulation between floor levels. This would also allow every second level corridor space to be incorporated into living space. Unit sizes can be altered within the building by borrowing living space from adjacent units. It is structurally possible to add additional floors at roof level, creating new apartments for sale. The sale proceeds could be used by the cooperative to fund a rehabilitation program.

14 SUGGESTED IMPROVEMENTS PROGRAM

The following suggested improvement projects have been prepared to provide the building cooperatives with self-contained projects which can be completed with no dislocation of the tenant. They can be undertaken in various combinations as budgets permit: all of the owners would have to approve these projects and the overall budget. Work has been arranged by construction building trades to allow separate contractors to perform work on different parts of the building, independent of the others' work areas. Finally, work packages have been prepared for both the common areas and the individual flats.

Some of this work would be considered "ordinary repairs" and "replacement in kind" by the building code officials and other work would require permits in that it would involve "upgrades" and "alterations" of the electrical, plumbing, ventilation systems, etc. It is the interpretation of at least one chief municipal building official that when rehabilitating any existing building, the new

building codes must be met. All work requiring permits is considered new construction by the new building code. There is no "grandfather" clause that would allow rehabilitation work to avoid conformity to new codes.

14.2 Project No. 1 - Exterior Wall Panel Joint Repair

This work includes repair of the deteriorating exterior wall panel joints on the industrial slab constructed buildings. The goal of the repair would be to extend the useful life of these buildings by eliminating the water penetration into these joints and subsequent deterioration of the grout infill and steel reinforcement bars. The thermal gap would be eliminated at this location as well. The scope of work is as follows:

- Remove by sawcutting (30 centimeters wide by 2.5 centimeters deep) the plaster parge coating and any other loose coating on each side of the vertical and horizontal panel joints. Remove all deteriorating packing (usually paper) and grout from joint. Power grind all exposed corroded steel reinforcing rods in joints. Recoat bars with rust inhibitive paints. Install rigid polystyrene insulation material (at least 5 centimeters thick) into joint and regrout all voids in joint with polymer grout material. Provide plaster stops on both sides of center of joint leaving a 2.5 centimeter wide joint. Replace plaster parge coat on both sides of joint. Seal joint with high quality polyurethane sealant. Repair all spalled parge coating over rest of wall as required.
- Wash and repaint entire wall where repairs have been made.

Cost (based on single stairway) . . . . . 895,000 leva ($35,800.00)

14.4 Project No. 2 - Radiator Thermostatic Control Valves

This project calls for all manually operated control valves to be replaced by an automatic thermostatic control valve on each radiator. When the temperature reaches a certain preset limit in the apartment, it automatically cuts the hot water off to that unit. Windows would no longer serve as temperature control devices for these units. When the temperature lowers, the valves would open, allowing radiators to receive hot water.

Cost (per radiator) . . . . . 2,750 leva ($110.00)

14.6 Project No. 3 - Shower Receptor Installation

The built-in showers on some of the older bathroom modules were designed so that run-off water from the shower spray flowed along the floor to the center of the module to a floor drain. The scope of this project is to upgrade this whole arrangement by providing a raised shower receptor (precast concrete, 1670 centimeters long by 700 centimeters wide) with a drain positioned towards the plumbing wall side. This drain would be connected to the PVC (polyvinylchloride) waste line extending from the sink drain approximately 600 centimeters away. Work includes core drilling of floor and plaster repair to ceiling below. It does not include shower enclosure or curtains which would be installed by tenant. Wall finishes are not included.

Cost (one bathroom) . . . . . 12,500 leva ($500.00)

14.8 Project No. 4 - Bathtub Installation

This project is a variation of Project No. 3, except that a bathtub is being substituted for the shower receptor.

Cost . . . . . 37,500 leva ($1,500.00)

14.10 Project No. 5 - Ground Fault Interrupter Receptacle Installation

This project calls for the installation of a ground fault interrupter receptacle (GFI) in each bathroom module that has a spray-type, portable shower spray. GFI outlet to be 15 amp, type MC cable and will replace current receptacle near hand wash sink.

Installation of the GFI receptacle will eliminate the possibility of electrical short circuiting of the unprotected outlet from water spray. The present arrangement presents a clear danger of electrocution.

Cost . . . . . 5,000 leva ($200.00)

14.12 Project No. 6 - Bathroom Exhaust Fan & Flue Installation

Some of the older bathrooms rely on a gravity ventilation system which is handled by open grilles located in the plumbing pipe chase vented to the roof. This arrangement has many problems relating to moist bathroom surfaces, accelerated deterioration of bathroom fixtures and trim, noise from units above and below, and loss of fire separation integrity from floor to floor.

This project proposes to replace these open grilles with mechanical ventilation. Grilles are to be removed, as are the precast caps at the top of the plumbing chase. A central PVC exhaust duct is to be lowered down shaft, with outlets for connection to openings to each bathroom module. A low noise, round residential, bath exhaust fan with back damper, 50 CFM, with electrical circuit connected to the light switch is to be installed.

Cost . . . . . 337,500 leva ($13,500.00)

14.14 Project No. 7 - Upgrade Panel Radiators

This project is simply to upgrade the existing short life hydronic panel radiator terminal units in each room. The scope of work calls for replacement with longer lasting 55 millimeter cast-iron radiators.

Cost (based on 3 radiators/unit) . . . . . 26,250 leva ($1,050.00)

14.16 Project No. 8 - Balcony Slab & Railing Repairs

The repair of typical distressed balcony slabs and railings is difficult to quantify without an exhaustive balcony by balcony inspection. In general, problems with the slabs involve spalling of forward edges of concrete and exposed reinforcing steel. Spalling is caused by corrosion of steel reinforcing, due to close proximity of steel to the surface of the concrete. Lack of sufficient protection by concrete allows moisture to penetrate the concrete and come into contact with the reinforcing. Subsequent rusting or oxidation causes the steel to increase in volume, exerting pressure until the concrete cover breaks off. Repair of this condition requires all concrete to be sounded with a hammer to locate loose or spalling concrete, removal of same, removal of rust from exposed reinforcing steel, recoating steel with rust-inhibitive paints and patching of concrete with epoxy patching material. Rusted railing, posts and panels are repaired by power grinding, repainting with rust inhibitive paints and new exterior paints. Metal panels may be replaced with weather resistant materials such as ceramic coated panels, cementitious boards or prefinished baked enamel sandwich panels.

Another balcony problem occurs due to the sloping of the slab toward the building. This condition allows water to accumulate along the bottom of the wall panel with resulting deterioration of the caulking joint. Water can then enter the unit. Slight topping coats can be provided to help drain the slab in some instances. In other cases, weep holes can be drilled to drain the balcony. In some cases, installing ceramic tile with an outward sloping setting bed can correct the condition. In all cases, however, a maintained high-quality polyethylene sealant should be applied to the wall and slab joint where such conditions exist.

Cost (one typical balcony) . . . . . 87,500 leva ($3,500.00)

14.18 Project No. 8 - Balcony Enclosures

The current unsightly assortment of balcony enclosure systems at most housing complexes comes from the lack of any uniform design controls, poor or inadequate maintenance and use of a wide variety of materials and treatments. Currently 40 to 50 percent of northward facing balconies are enclosed by metal curtain walls, wood enclosures, steel bars, or any combination of the three. These balconies are the most prominent architectural element along the large concrete panel buildings, and should be upgraded in order to improve the overall visual quality of the complexes.

This project deals with this visual problem by treating the entire balcony tier, enclosures and railing treatments, as one architecturally designed entity. In order to visually control the building's appearance, all tiers must be addressed. However, as a demonstration project, only one tier of a 9-story building is priced out. The scope of work includes removal of all existing railings and enclosures and the installation of a duranodic aluminum curtain wall system which includes an operable sash, glazing, panels and a curved canopy enclosure at the top of the tier on

the 9th floor level. Installation of the balcony tier enclosure will protect the existing balcony slabs from further weathering and deterioration.

Cost (per 9-story tier) . . . . . 875,000 leva ($35,000.00)

14.20 Project No. 9 - Roof Repairs

A frequent complaint regarding roofs is focused on the parapets along the building's perimeter. The 3 and 4-ply asphaltic built-up roofing is run up the parapets as base flashing and tucked up under the pre-cast concrete copings. This type of arrangement does not allow for expansion and contraction of the roofing felts and is subject to ultraviolet degradation from solar radiation. The lack of reglets and metal counterflashing below the copings allows the plies to slip. Strain on ply joints and degradation of the felts allows water penetration of the roofing system. Water then finds the first hole in the roof slab (often chases and plumbing vents) and leaks into units below.

It should be noted that most roofs have exposed roofing felts (not protected by gravel ballast) for easier maintenance of joints. However, in lieu of lack of maintenance, this arrangement merely allows damage to roofing system by ultra-violet degradation. Many roofs did have individual television antennae with resultant punctures of the roofing membranes.

The scope of roof repairs includes temporary removal of the parapet wall coping, reattachment of the fabric felt base flashing and joint lap resealing with asphalt compound, installing metal counterflashing and reinstallation of the wall coping. It also calls for reflashing the plumbing chase parapet in a similar manner.

While complete reroofing is not within the scope of this project, it is suggested that when replacement is done, new built-up roofing be protected by ballast or upgrading to a single-ply modified bitumen or EPDM membrane system in full accordance with good, established roofing standards. All individual TV antennae should be replaced with a single central antennae system with all roof anchoring in full accordance with industry standards.

Cost . . . . . 625,000 leva ($25,000.00)

14.22 Project No. 10 - Site Improvements

The grounds around the housing blocks are maintained by the municipality. As previously mentioned in this report, funds for maintenance are not available, so site components such as driveways, parking areas, curbs and gutters, walkways, lighting, grading and landscaping are unfinished or deteriorating. Often when utility repairs are made, trench regrading has not been done, or is awaiting completion by another department.

This project proposes a site improvement package that could be developed for individual stairway cooperatives or for the entire building at an estimated cost of 250,000 leva ($10,000)

per stairway. Work would include improvement to paved road and parking areas in front of the stairway entrance by a new asphalt top coat and sealer, providing a pedestrian walkway and a small seating area near the entrance, regrading reseeding and tree/shrub plantings. The municipality as well as the cooperative would need to approve this work.

Cost (one stairway) . . . . . 250,000 leva ($10,000.00)

Note: Other improvement packages could be proposed such as upgrading of stair and hallway finishes, elevator cab upgrading, security system installation and interior wall and floor finish upgrading. However, interior flat upgrades are owner-occupant responsibilities and hallway, stairway and elevator upgrades are more maintenance issues.

16 SUGGESTED WORK PLAN

This suggested work plan is organized into two parts. The first portion concerns itself with the immediate short term in that it suggests all the steps necessary to bring about the **demonstration project**. This demonstration project is intended to show the feasibility of private sector renovation and rehabilitation of deteriorating urban housing.

The first part will consist of five phases.

16.2 Initial Phase

Consists of rapid reconnaissance of existing housing stock in the Sofia area. It includes identification of candidate rehabilitation building sites and identifies chronic structural defects and distress that need to be addressed in a demonstration project. This phase has been completed.

16.4 Research Phase

Consists of contacting specific housing cooperatives to explain the concept of a demonstration project. Requires initial interest from cooperative plus tentative approval pending more financial and technical data. Consists of entering into discussions with banks and lending institutions for purposes of establishing loan commitments and terms. Research on availability of building materials and their current costs needs to be developed. For example, radiator valves and bathroom exhaust fans: what sizes are available, what do they cost and are they locally produced/supplied or do they have to be imported? What are the lead times for ordering? All panels, conditions, pipes, locations of all components of each demonstration project must be accurately field measured. Building plans, specifications and shop drawings must be obtained. Ongoing information status reports with all parties must be given, particularly the subject cooperative.

16.6 Approval Phase

This phase requires preliminary and final approvals in principle from all parties: owners cooperative, building department, lending institution, sponsor. A local architect and consultants need to be hired. Final plans and specifications must be developed for submission to the building department. Review and final approval by local municipality must be obtained.

16.8 Bidding Phase

Local screening of rehabilitation contractors needs to be undertaken. Bid documents are to be distributed to contractors. Bids are to be received, reviewed and approved as appropriate. A construction contract needs to be signed.

16.10 Construction Phase

A pre-construction among between owner's cooperative, contractor and sponsor kicks off construction. Progress of construction is monitored, requisitions signed, disputes resolved, if any. Construction completed, inspected and approved.

DEMONSTRATION PROJECT WORK PLAN							
Work Item	**Length Of Time To Complete***	**Review Approval Period***	**Person Designation**			**Overlap Possibility**	**Comments**
			A	**B**	**C**		
INITIAL PHASE							
1. Recon	0 - 1.5				X		Completed
2. Select type	1 - 2				X		Completed
3. Select distress	1.5 - 2.5			X			Completed
4. Monitor		2 wks			X		
RESEARCH PHASE							
1. Contact co-ops	4.5 - 5.5		X			1-6 wks	Very difficult
2. Arrange loan	4.5 - 6.5				X	1-6 wks	First ever attempt
3. Materials	4.5 - 5.5			X		1 wk	May have to import
4. Field measure	4.5 - 6.5		X	X		No	Simple task
5. Monitor		2 wks			X		
APPROVAL PHASE							
1. Prelim. OK	8.5 - 13.5			X		5 wks	Must keep co-op **informed**
2. Hire Arch/Eng	8.5 - 9.5		X	X		No	Needs to be local?
3. Plans/specs	9.5 - 13.5		X	X		2 wks	Package will vary
4. File permit	13.5 - 14.5		X			No	Only if <u>needed</u>
5. Final OK	14.5 - 18.5		X			1-6 mos	Will test system
6. Monitor		2 wks			X		
BIDDING PHASE							
1. Screening	14.5 - 16.5				X	No	Should be easy to do
2. Bidding	16.5 - 19.5		X			No	Bid may be complicated
3. Award	21.5 - 22.5				X	No	Need sponsor/owner OK
4. Monitor		2 wks			X		
CONSTRUCTION PHASE							
1. Start	24.5 - 25.5				X	No	Need kick-off mtg.
2. Inspect	25.5 - 51.5			X		No	Ongoing supervision
3. Complete	51.5 - 52.0		X			1-6 mos	Depends on financing
4. Monitor		N/A			X		

* Numbers designate week of year starting from January 1, 1993 as 0, last week of December as 52.

Note: Under Person Designation column, the letters refer to the following personnel:

A = Local architect type (such as Statkov Chaudar)
B = Local engineer type (such as Georgi Harizanov)
C = Padco consultant (such as Ron Polniaszek, Hank Henward or Jim Lynch)

APPENDIX
FIELD RECONNAISSANCE

1 - View of Sofia from 6th floor Vitosha Hotel looking east.
2 - Example of non-conforming construction at 45 Vitosha Blvd.
3 - Example of non-conforming construction at 45 Vitosha Blvd.
4 - 8 flats at 15 Galichitza Street, Lozenec.
5 - View of Galichitza Street, Lozenec.
6 - Traditional monolithic construction at 33 Charles Darwin, Izgrev.
7 - 20-story (trad. mono.) tower, Izgrev.
8 - Monolithic frame, clay tile and CMU block infill walls.
9 - Note clay tile wall and concrete form impressions.
10 - CMU wall has broken block and some open mortar joints.
11 - Brick and mortar infill on canopy cantilever.
12 - Note honeycombing of concrete drop beam.
13 - Concrete walls have embedded whalers, note wall alignment.
14 - Concrete beams have leaves and wood cast in; note cold joint.
15 - Close up of beams, walls and upper level form work.
16 - Many open clay tiles were found, also rotated tile in wall.
17 - Mason laying broken clay tile along with whole.
18 - Steel reinforcement rod men. Note thinness of steel.
19 - Mortar was mixed directly on floor slab.
20 - Example of clay tile wall construction. Note plumb line.
21 - Overview of older and newer housing in Izgrev district.
22 - Note steel reinforcing has missed column and dirt on slab.
23 - Close-up of typical clay tile used in wall construction.
24 - Joint between concrete wall and floor slab.
25 - Older single family structures with clay tile roofs, brick walls.
26 - Example of upper income housing at 7 Jaroslav Veshin, Triadiza.
27 - Older single family residence in Triadiza.
28 - Children's multi-functional clinic in Ovtcha Coupel.
29 - View of additions to children's clinic.
30 - Multi-family block housing in Volujak district.
31 - Multi-family block housing in Volujak district.
32 - Multi-family block housing in Volujak district.

1 - Power plant for city heating system - Volujak district.
2 - Cement plant at Pan Contracting Company - Volujak.
3 - Georgi Harizanov country house in Suhodul (near Sofia).
4 - Typical residence in farming village of Suhodul.
5 - Interior plaster wall/ceiling finishes, Harizanov home.
6 - Close-up of electrical wiring.
7 - Example of concrete work and brick wall.
8 - Spiral steel stair will receive stone treads.
9 - New concrete roofing tiles with older clay tile in distance.
10 - New concrete roofing tiles with older clay tile in distance.
11 - Roofing includes tiles, furring, vapor barrier, sheathing and plaster.
12 - View of plumbing stack and scratch coat of plaster.
13 - View of housing in Suhodul village.
14 - Another view of residences in Suhodul.
15 - When final coat of plaster, house is finished and must start paying taxes.
16 - Stream through village has farms alongside.
17 - Another view of Harizanov residence, Suhodul.
18 - Typical village out buildings in Suhodul.
19 - Although lived in, homes do not have final finish coats.
20 - Typical street scene, Suhodul.
21 - Another view of Sofia from Vitosha Hotel looking northeast.
22 - View of Sveta Nedelya Square.
23 - Zum Department Store on left, former party headquarters in center.
24 - The Church of St. Nedelya.
25 - The Church of St. Petka Samardjiiska (of the Saddlers).
26 - The Church of St. Petka Samardjiiska (of the Saddlers).
27 - Banya Bashi Mosque.
28 - Typical street scene - Vitosha Boulevard.
29 - Typical street scene - Vitosha Boulevard.
30 - Sofia synagogue.
31 - Walking towards Alexander Batenberg Square along Tsar Osvoboditel.
32 - National Art Gallery in former king's palace.
33 - Entrance to president's office.
34 - Interior of the National Archaeological Museum.
35 - Interior of the National Archaeological Museum.
36 - Ivan Vazov National Theatre.

1 - View of lower park at Alexander Batenberg Square.
2 - Street scene along Tsar Osvoboditel Boulevard.
3 - St. Alexander Nevsky Memorial Cathedral.
4 - Street vendors in Plaza Alexander Nevsky.
5 - St. Alexander Nevsky Memorial Cathedral.
6 - Russian church on Tsar Osvoboditel Boulevard.
7 - Russian church on Tsar Osvoboditel Boulevard.
8 - The Rotunda of St. George.
9 - The Rotunda of St. George, entrance.
10 - Housing blocks in Krasna Poljana.
11 - Housing blocks in Krasna Poljana.
12 - Housing blocks in Krasna Poljana, building 620.
13 - Housing block in Mlodast.
14 - Example of balcony security enclosure, Mlodast.
15 - Potential demonstration building, 351b Mlodast.
16 - Typical industrial slab construction, 345 Mlodast.
17 - Note various treatments of balcony enclosures, Mlodast.
18 - Overview Mlodast housing blocks, note grounds.
19 - Overview of industrial slab housing blocks - Mlodast.
20 - Despite different balcony enclosures, colors add some life.
21 - Colored facade stands in contrast to grey buildings.
22 - Grounds around buildings lack landscaping, amenities.
23 - Many buildings take 6 to 7 years to complete.
24 - Two types of construction visible; industrial slab and traditional monolithic.
25 - Attempt to add variety to facade with patterned forms.
26 - Close-up view of patterned concrete wall panel.
27 - Each balcony enclosure has been done differently.
28 - Close-up of Mlodast balcony treatments.
29 - Balcony stacks provide vertical emphasis, multiple enclosures.
30 - Another view of uncoordinated balcony enclosures.
31 - Vertical articulated buildings add variety to housing blocks.
32 - Overview of housing in Ljulin district.
33 - Overview of housing in Ljulin district.
34 - Older housing in Sofia.
35 - Older housing in Sofia, built in 1960's.
36 - Older housing in Sofia, built in 1960's.
37 - "Leaning Tower of Sofia" on Lidice Street.

1 - Deteriorated exterior stair, Triadiza.
2 - Well articulated facade, Triadiza.
3 - Grounds surrounding buildings typically are not maintained.
4 - Trash and debris litter grounds in Emil Markov district.
5 - Entrance lobby showing stairs, mail boxes and radiator.
6 - Overview of Emil Markov housing area.
7 - Overview of Emil Markov housing area.
8 - Kitchen of owner flat at building 2 (experimental) Emil Markov.
9 - Close-up view of columnar radiator and piping.
10 - Balcony has been covered with ceramic tile pavers.
11 - Windows were double paned, PVC with weeps.
12 - Door to balcony has hopper vent above.
13 - Interior view of living room, Emil Markov housing area.
14 - Bathroom modules have tiled floors and vinyl wallpapered walls.
15 - Underside of ceiling above shower area of bath module.
16 - Insulated heating lines show evidence of leaks.
17 - Soil and waste stacks are cast iron.
18 - Close-up of domestic water lines.
19 - View of water closet, bidet and lavatory.
20 - Water lines are copper. Note bends and welds.
21 - Electrical sleeves in precast concrete panel.
22 - Balcony railing under construction.
23 - Vertical risers to fire hose station.
24 - Building under construction in Emil Markov area.
25 - Plasterers parge coating underside of concrete slab.
26 - Close-up of clay tile wall back-up with plaster finish.
27 - Finished example of similarly constructed housing block.
28 - View of cantilevered balcony stack, Emil Markov area.
29 - Note concrete wall finishes.
30 - Note steel reinforcing atop canopy, wall crack.
31 - Wall slab seems to have been dropped atop floor slab.
32 - Wall alignment appears to be result of lack of ties.
33 - There are many reinforcement bars protruding from slab.
34 - End view of building under construction, Emil Markov area.
35 - Form work and drainage piping near construction site.
36 - Balcony enclosures in Emil Markov housing area.

1 - View of end wall of industrial slab building. Note spalled joints.
2 - Balcony railing panels are corroding, Emil Markov area.
3 - Overview of courtyard between Emil Markov housing blocks.
4 - Remodeling of small commercial building in Sofia.
5 - Overview of industrial slab, precast panel housing - Mlodast.
6 - Industrial slab construction in progress.
7 - No workers on site, has been under construction several years.
8 - Precast stair is attached to landing by weld plates.
9 - Note alignment of landing with top stair tread.
10 - Joints between slabs are grouted in.
11 - Close-up view of steel reinforcing bars between panels.
12 - Reinforcing steel is welded and coated with preservative.
13 - View of floor and wall slab connection.
14 - Steel has been placed every second panel opening.
15 - Balcony railing panel slab connection detail.
16 - Door frame detail. Note wall panel reinforcement bars.
17 - View of precast bathroom modules.
18 - View of precast wall and floor panels.
19 - Note grouted joints, spalled floor panels.
20 - Wall to wall connection detail.
21 - Note floor slab transverse connection.
22 - Walls are supported by welded reinforcement bars.
23 - Another view of precast industrial slab construction.
24 - Grounds between buildings are not maintained.
25 - Another example of balcony enclosures - Mlodast.
26 - Large traditional monolithic constructed building in Sofia.
27 - Large traditional monolithic constructed building in Sofia.
28 - Rivers have been placed in flood control culverts.
29 - Traditional monolithic construction on Lidice Street in Sofia.
30 - Example of shutter system of construction, Ljulin.
31 - Most of balconies have been enclosed, Ljulin.
32 - Overview of spalling joints in industrial slab building.
33 - Close-up of panel joint showing packing.
34 - Black line has been painted on plaster to locate panel joint.
35 - Most bathroom modules leak at shower plumbing.
36 - Typical owner flat kitchen.
37 - Telecommunication cables are lightly covered by parge coating.

1 - Panel grout infill is easily seen on stairwell walls.
2 - Vertical and horizontal panel joints are open.
3 - Vertical joint details lack waterproof integrity.
4 - Overview of industrial slab joint spalling.
5 - Some vertical/horizontal joint intersections have been flashed.
6 - Note water leaks at corner of return.
7 - More evidence of water problems at slab joints.
8 - An attempt at repairs has been done to upper portion of building.
9 - More joint water penetration. Note close drying racks.
10 - Failed slab joint. Plaster parge coat spalling off.
11 - Interior courtyard near Tsar Simeon Street.
12 - Some old single family residences near Triadiza area.
13 - New single family residence, Sofia. Note finishes.
14 - Another view of single family residence, Sofia.
15 - Close-up of failing vertical joint, Emil Markov housing area.
16 - Plaster parging is spalling, allowing water penetration.
17 - Balconies to north are generally enclosed.
18 - Balconies to south are left open.
19 - Overview of 242 BXA housing block, Emil Markov.
20 - Note various balcony enclosure treatments.
21 - Balcony slabs are deteriorating, railings corroding.
22 - End walls with advertising murals add variety.
23 - Another example of effective advertising.
24 - These buildings in Ljulin housing area have joint problems.
25 - Horizontal joints have been repaired recently.
26 - Close-up of poor joint repairs due to water infiltration.
27 - Repairs to joints are done by owner-occupant of flat.
28 - Poor condition of joints is typical in Ljulin area.
29 - Industrial slab construction, if not maintained, is not attractive.
30 - Some color on buildings helps enliven housing blocks.
31 - Grounds between buildings are left uncompleted.
32 - Example of historic rehab in older part of Sofia.
33 - Here, parge coating has been turned into work of art.
34 - Party headquarters at Alexander Batenberg Square.
35 - Party headquarters, note burn scorch marks.
36 - Jim Lynch and Rayna Tsvetkova at 45 Vitosha Boulevard.
37 - Hank Henward, Michael Hoffman and Maya Koleva at 45 Vitosha Boulevard.